299-E33-05 (A4870)
Log Data Report

Borehole Information:

Borehole:	299-E33-05 (A4870)		Site:	216-B-47 Crib	
Coordinates (WA St Plane)		GWL[1] (ft):	237.4	GWL Date:	10/16/07
North (m)	East (m)	Drill Date	TOC Elevation	Total Depth (ft)	Type
137606.42	573574.23	June 1955	638.02 ft	237.4	Cable

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded Steel	2.5	8 5/8	8	5/16	2.5	238.5
Welded Steel	0.5	4.5	4	1/4	2.0	214.5

Borehole Notes:

This borehole was first logged with the SGLS in October 2002. Other spectral gamma logs were acquired with the Radionuclide Logging System (RLS) in 1991 and 1994 by Westinghouse Hanford Company and in 1997 by Waste Management Federal Services NW. This logging event was conducted to provide current information for decommissioning of the borehole.

Logging Equipment Information:

Logging System:	Gamma 1B		Type:	35% HPGe SN: 36TP21095A
Effective Calibration Date:	05/25/07	Calibration Reference:	HGLP-CC-017	
		Logging Procedure:	HGLP-MAN-002, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4	5
Date	10/09/07	10/11/07	10/12/07	10/15/07	10/16/07
Logging Engineer	Spatz	Spatz	Spatz	Spatz	Spatz
Start Depth (ft)	20.0	73.0	120.0	180.0	236.0
Finish Depth (ft)	3.0	19.0	72.0	119.0	210.0
Count Time (sec)	200	200	200	200	200
Live/Real	R	R	R	R	R
Shield (Y/N)	N	N	N	N	N
MSA Interval (ft)	1.0	1.0	1.0	1.0	1.0
ft/min	N/A	N/A	N/A	N/A	N/A
Pre-Verification	AB012CAB	AB013CAB	AB014CAB	AB015CAB	AB016CAB
Start File	AB012000	AB013000	AB014000	AB015000	AB016000
Finish File	AB012017	AB013054	AB014048	AB015061	AB016026
Post-Verification	AB012CAA	AB013CAA	AB014CAA	AB015CAA	AB016CAA
Depth Return Error (in.)	0	0	0	+ 0.5	N/A
Comments	No fine gain adjustment	No fine gain adjustment	No fine gain adjustment	No fine gain adjustment	No fine gain adjustment

Log Run	6	7	8 Repeat	9	
Date	10/16/07	10/16/07	10/16/07	10/17/07	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	236.0	211.0	170.0	151.0	
Finish Depth (ft)	236.0	179.0	150.0	140.0	
Count Time (sec)	1000	200	200	200	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	N/A	N/A	N/A	N/A	
ft/min	N/A	N/A	N/A	N/A	
Pre-Verification	AB016CAB	AB016CAB	AB016CAB	AB017CAB	
Start File	AB016027	AB016028	AB016061	AB017000	
Finish File	AB016027	AB016060	AB016081	AB017011	
Post-Verification	AB016CAA	AB016CAA	AB016CAA	AB017CAA	
Depth Return Error (in.)	N/A	N/A	+ 0.5	0	
Comments	No fine gain adjustment	No fine gain adjustment	No fine gain adjustment	No fine gain adjustment	

Logging Operation Notes:

Logging was conducted without a centralizer installed on the sonde. Logging data acquisition is referenced to the top of the 8-in. casing. A repeat section was collected in this borehole to evaluate system performance.

Analysis Notes:

Analyst:	P. D. Henwood	Date:	11/29/07	Reference:	GJO-HGLP 1.6.3, Rev. 0

Pre-run and post-run verifications for the logging system were performed before and after each day's data acquisition. The acceptance criteria were met.

A combined correction for a 0.5625-in.-thick casing (0.25+0.3125 for the 4- and 8-in. casings, respectively) was applied to the log data to 214.5 ft depth. Below this depth a correction for 0.3125-in. thick casing was applied.

SGLS spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with an EXCEL worksheet template identified as G1BMay07.xls using efficiency functions and corrections for casing, water, and dead time as determined from annual calibrations.

Results and Interpretations:

Cs-137, Co-60, and Sb-125 were the manmade radionuclides detected in this borehole. Cs-137 was detected in four intervals: from 6 to 9 ft, from 51 to 65 ft, from 94 to 96 ft, and between 213 to 230 ft. The maximum concentration was 764 pCi/g at 54 ft. Other Cs-137 detections are statistical fluctuations.

Co-60 was detected in six intervals between 50 and 58 ft, from 65 to 68 ft, from 78 to 80 ft, 86 to 134 ft, from 143 to 181 ft, and from 231 ft to total depth at 236 ft. The maximum concentration was measured at approximately 11 pCi/g at 99 ft.

Sb-125 was detected at one depth interval (95 ft) at 2 pCi/g.

Comparison log plots of data acquired in 1991, 1994, 1997, 2002, and 2007 are included. All data are decayed to October 2007. Since 1991, Cs-137 and Sb-125 concentrations appear to have decreased as predicted by radioactive decay. Above 140 ft, Co-60 activities also are consistent with predicted decay. It was reported in 2002, that a

significant influx of Co-60 appeared to occur between 142 and 171 ft since 1997. Based on 2007 data, this influx may be continuing and additional increases from 165 to 181 ft are now apparent.

Because uranium contamination is observed in the groundwater at this borehole, energy peaks diagnostic of processed uranium were considered to determine if a vadose zone source existed. The minimum detection limits for the 185.72 keV (U-235), 766.36, and 1001.03 keV (Pa-234m, diagnostic of U-238) energy peaks are plotted. Processed uranium could exist at concentrations below these MDLs. The detections shown on the plot are statistical fluctuations and are not valid energy peaks. It appears no significant vadose zone source of processed uranium exists near this borehole.

Because migration of Co-60 is apparent in this borehole, it is recommended the borehole not be decommissioned at this time. Additional logging may help identify continued downward movement in the vadose zone or stability. Because Co-60 is a useful tracer for other contaminants such as Tc-99, rates of migration may be useful for modeling efforts. As reported in the 216-B-43 to -50, -57, and -61 Cribs and Adjacent Sites Waste Summary Report, possible Co-60 movement was identified in seven boreholes logged in 2002 in the 216-BY Cribs, as compared to 1992 log data. It is recommended these boreholes also be logged again.

Repeat data indicate good repeatability.

List of Log Plots

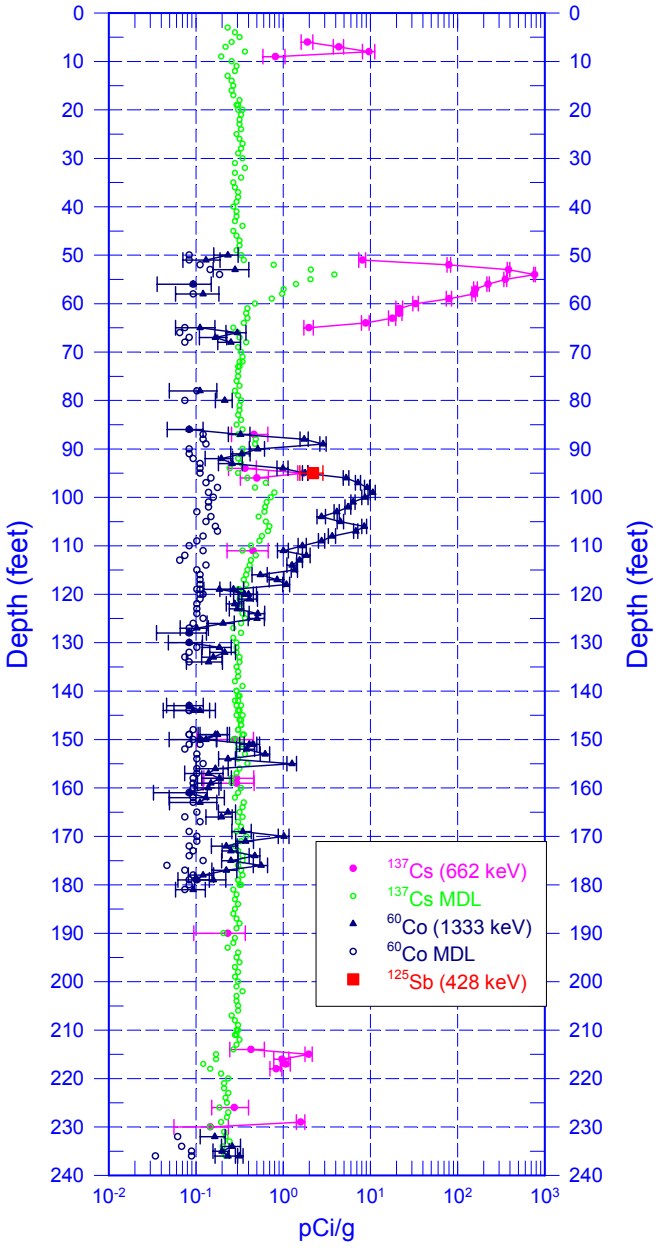
Manmade Radionuclides
Natural Gamma Logs
Combination Plot
Comparison of Manmade Radionuclides (0-240 ft)
Comparison of Manmade Radionuclides (120-190 ft)
Processed Uranium Energy Peaks
Repeat of Manmade Radionuclides
Repeat of Natural Gamma Logs

References:

2003. U.S. Department of Energy (DOE). *216-B-43 to -50, -57, and -61 Cribs and Adjacent Sites Waste Summary Report*. GJO-2003-458-TAC. Prepared by S.M. Stoller for the Grand Junction Office. Grand Junction, Colorado.

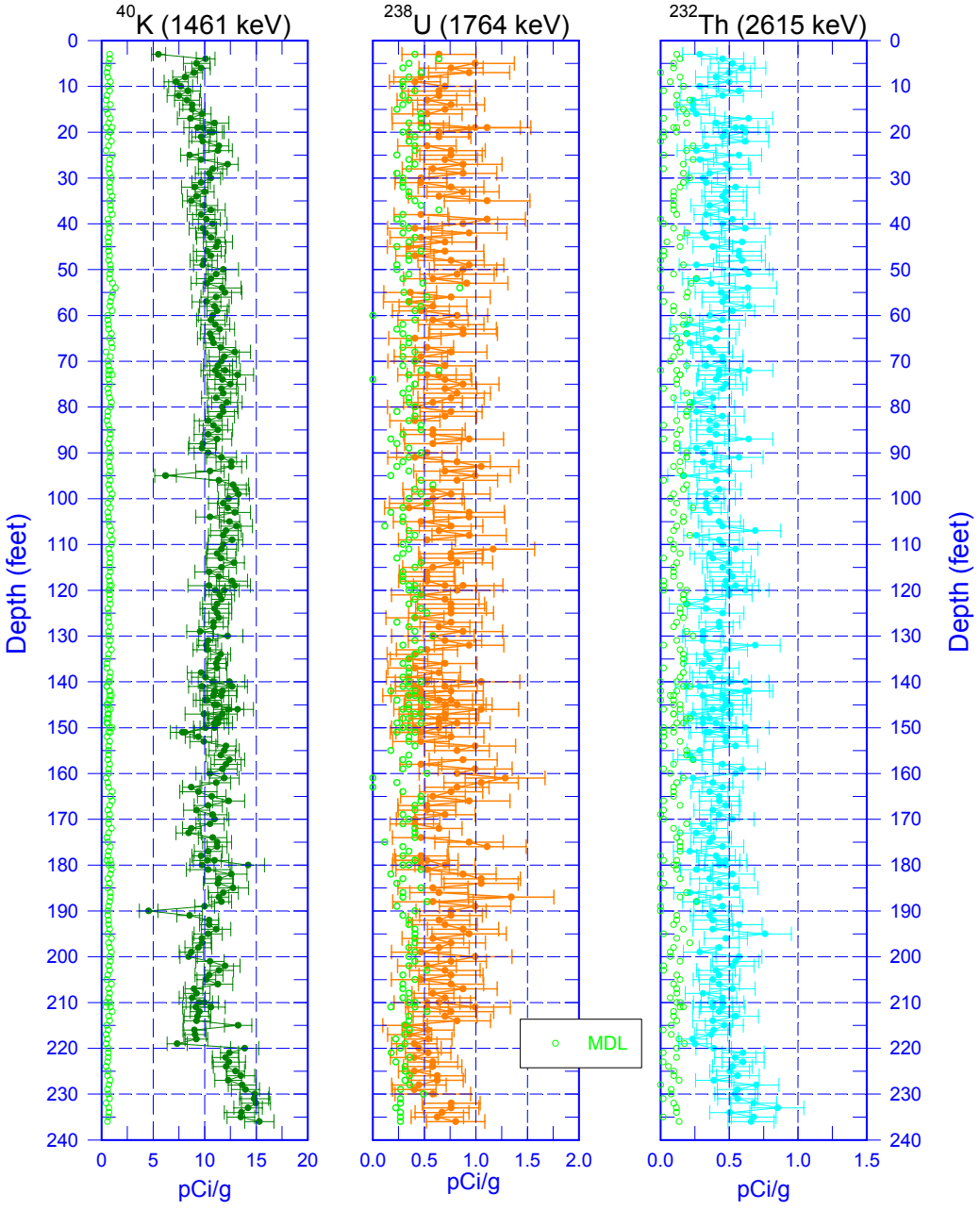
[1] GWL – groundwater level

299-E33-05 (A4870)
Manmade Radionuclides

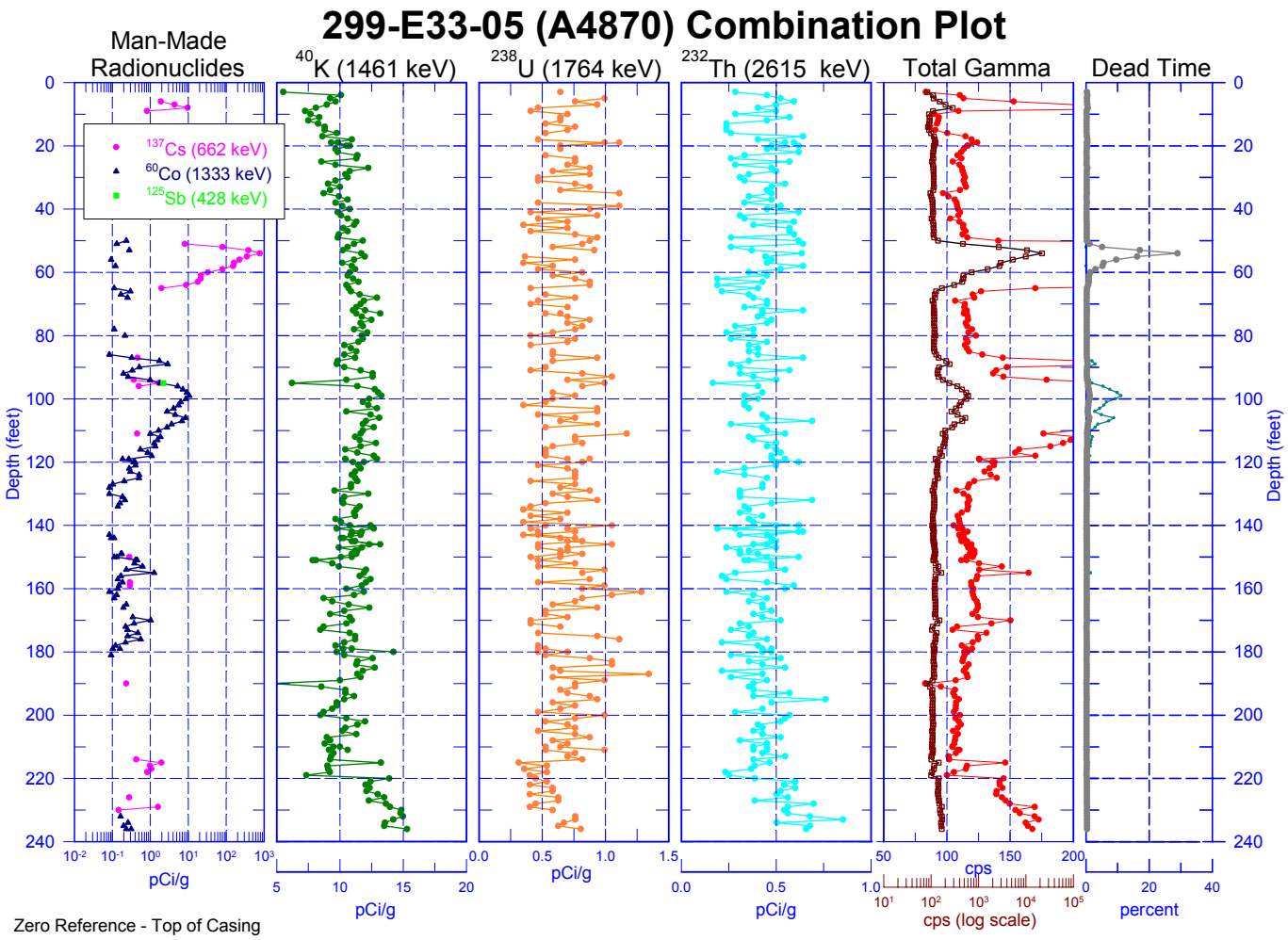


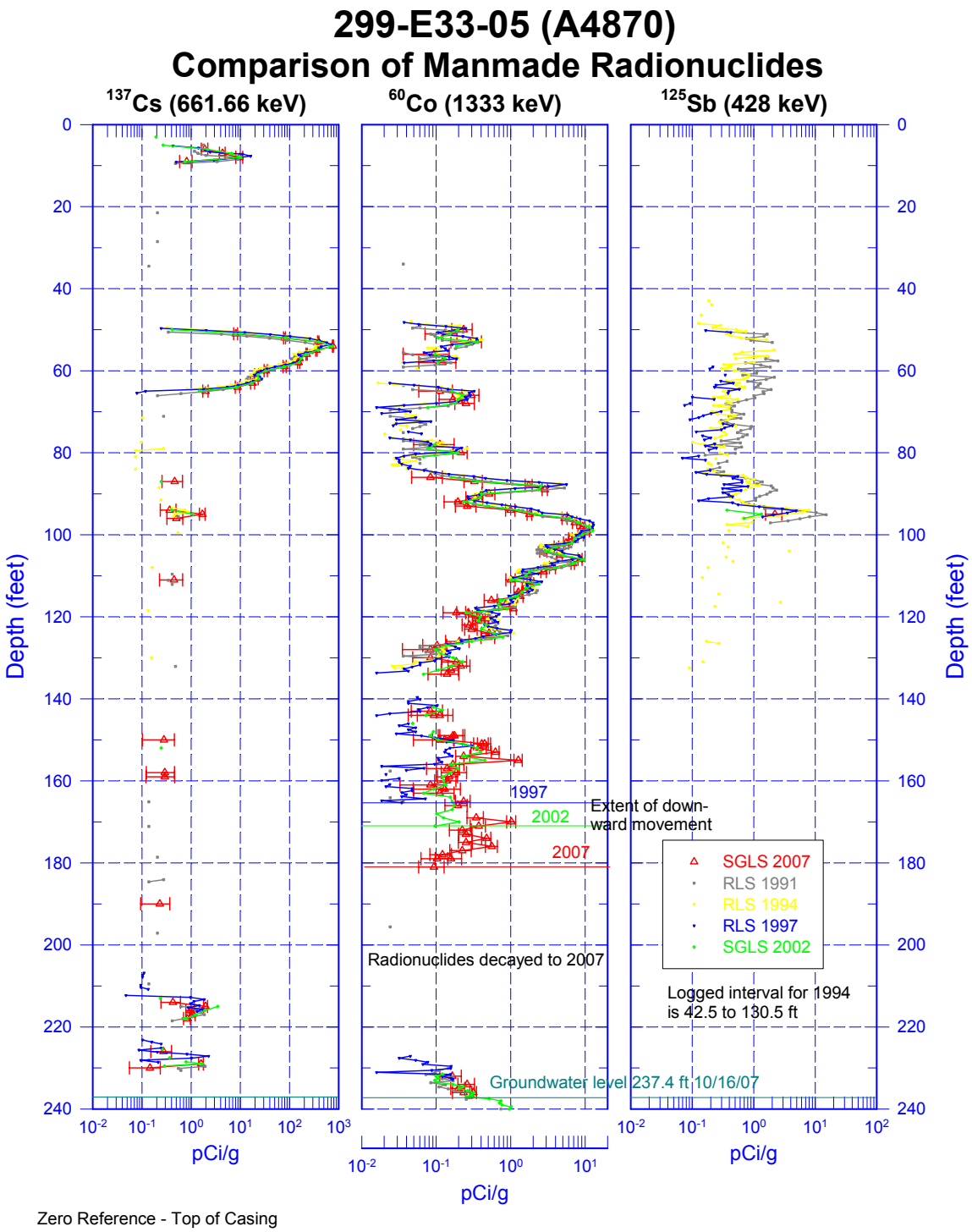
Zero Reference - Top of Casing

299-E33-05 (A4870)
Natural Gamma Logs

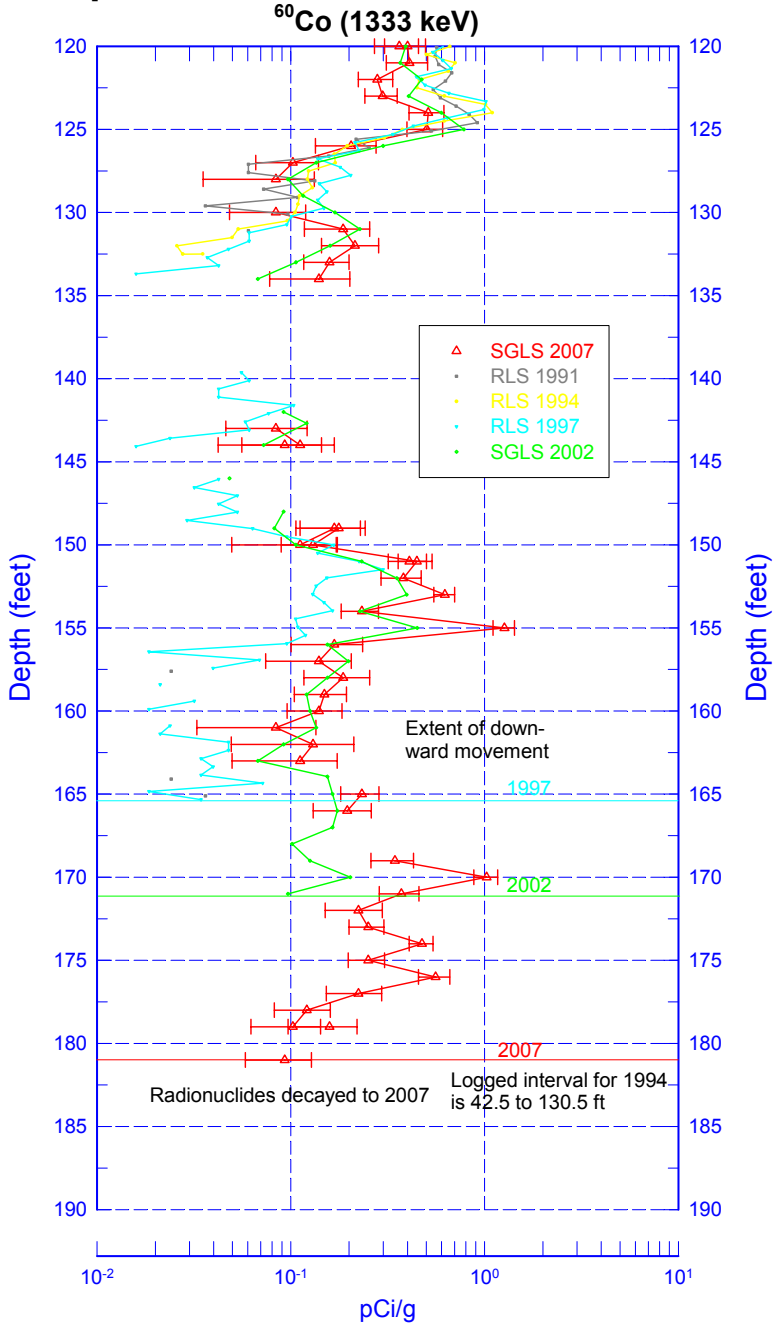


Zero Reference = Top of Casing


299-E33-05 (A4870) Combination Plot
Man-Made Radionuclides
40K (1461 keV)
238U (1764 keV)
232Th (2615 keV)
Total Gamma
Dead Time
137Cs (662 keV)
60Co (1333 keV)
125Sb (428 keV)
Depth (feet)
pCi/g
cps
cps (log scale)
percent
Zero Reference - Top of Casing

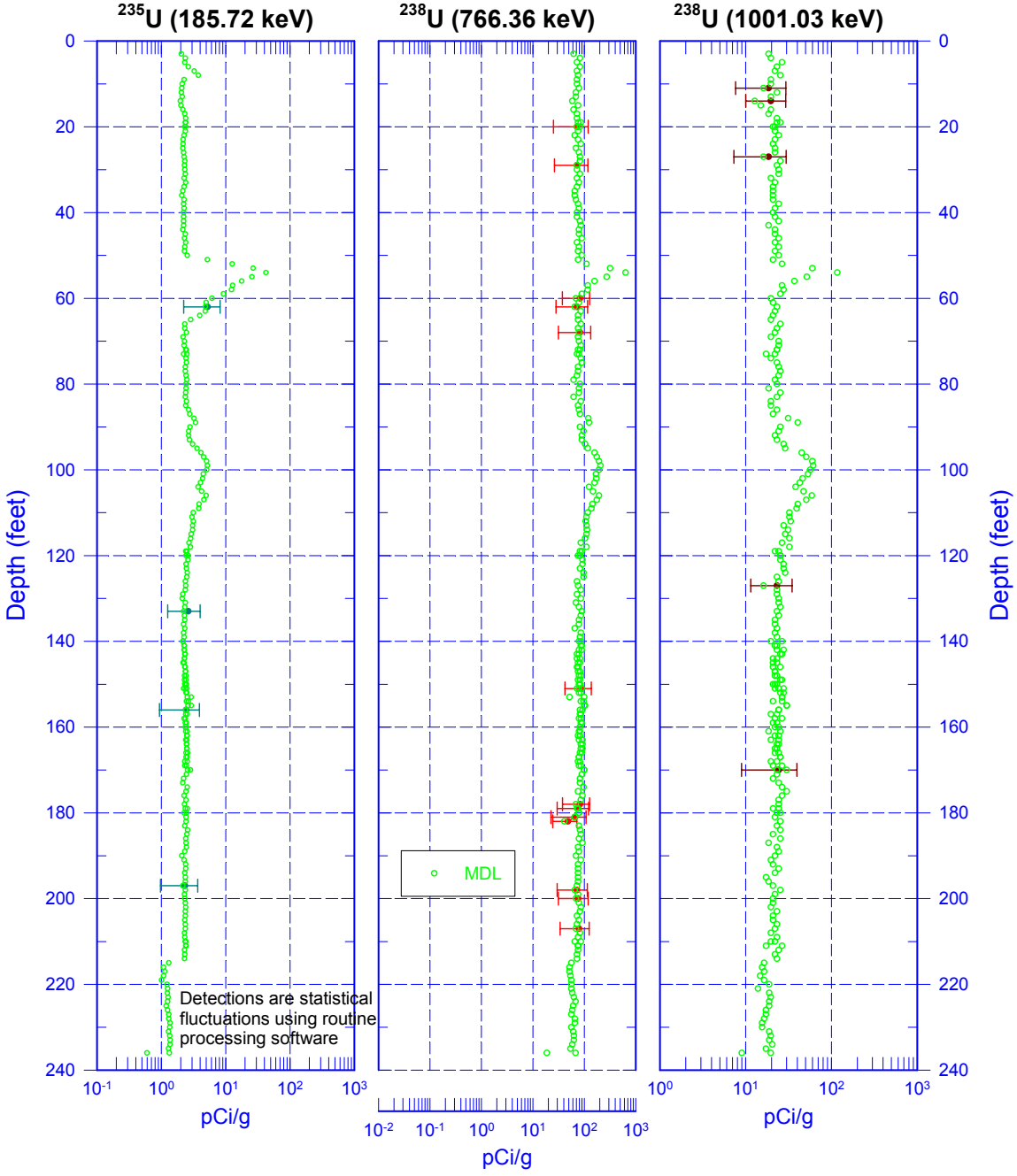

299-E33-05 (A4870)
Comparison of Manmade Radionuclides
137Cs (661.66 keV)
60Co (1333 keV)
125Sb (428 keV)
Depth (feet)
pCi/g
1997
2002
2007
Extent of down-ward movement
SGLS 2007
RLS 1991
RLS 1994
RLS 1997
SGLS 2002
Radionuclides decayed to 2007
Logged interval for 1994 is 42.5 to 130.5 ft
Groundwater level 237.4 ft 10/16/07
Zero Reference - Top of Casing

299-E33-05 (A4870)
Comparison of Manmade Radionuclides



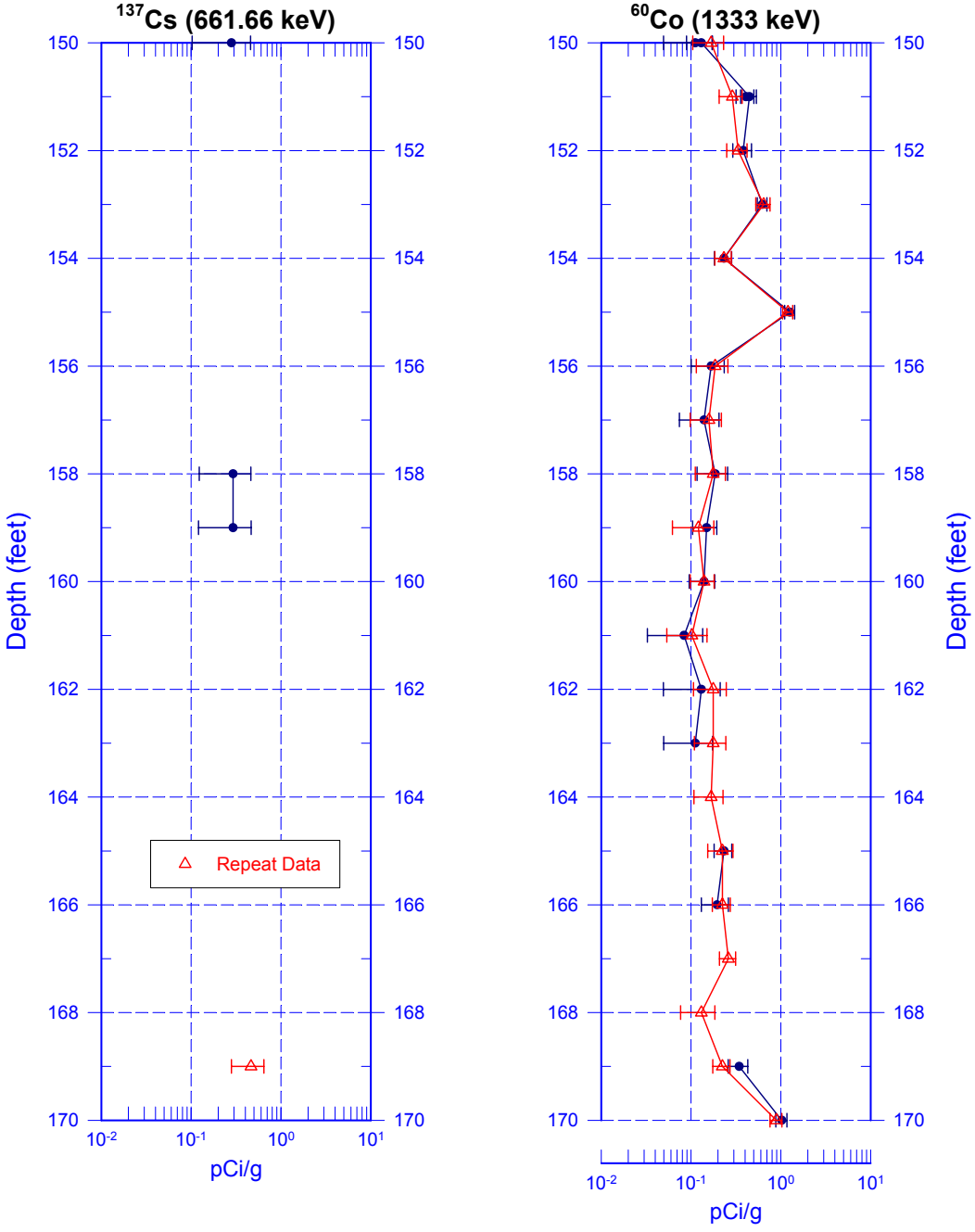
Zero Reference - Top of Casing

299-E33-05 (A4870)
Processed Uranium (^{235}U and ^{238}U) Energy Peaks



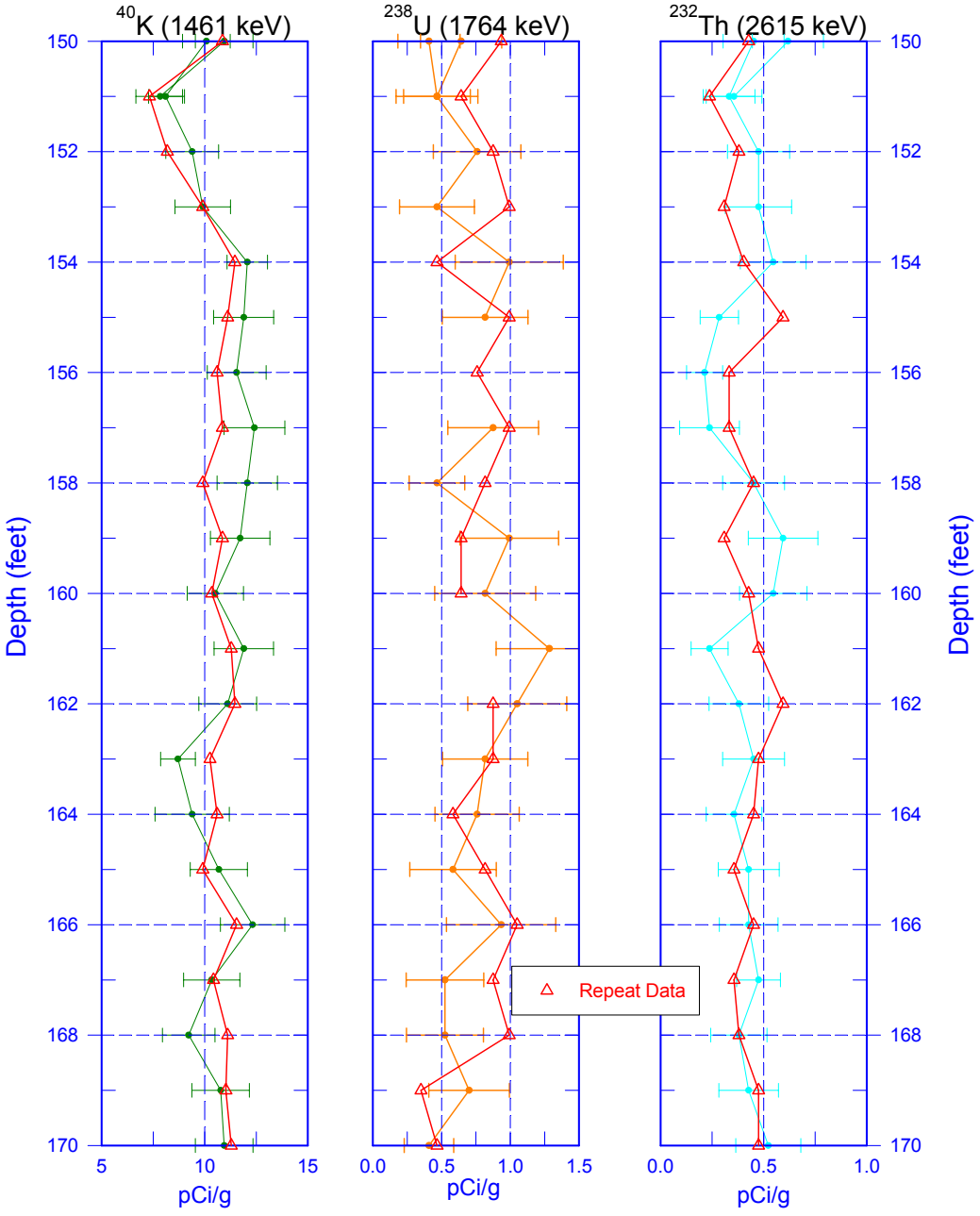
Zero Reference - Top of Casing

299-E33-05 (A4870)
Repeat of Manmade Radionuclides



Zero Reference - Top of Casing

299-E33-05 (A4870)
Repeat of Natural Gamma Logs



Zero Reference = Top of Casing